

BOTANY.—*Supplementary studies in Aeschynomene, I: Series Viscidulae, including a new species and five new varieties.* VELVA E. RUDD, U. S. National Museum.

(Received February 13, 1959)

A considerable number of *Aeschynomene* specimens have come to my attention since publication of "The American Species of *Aeschynomene*" (Contr. U.S. Nat. Herb. 32: 1-172. 1955). Some of these specimens are old, representing collections that have been ascribed to "familiar," widespread species without critical examination or that have spent years in the limbo of "indet" folders. Others are types and historical collections that I did not have access to earlier.

Among such specimens I find a few that I believe to represent new taxa and others that amplify the concepts of the old. This paper is essentially a recapitulation of the *Viscidulae* series of the genus *Aeschynomene*, but without repetition of detailed descriptions and explanations of synonymy given before. Included in this treatment is the description of one new species and five new varieties, presentation of a new specific name for an old variety, and reinstatement of two old specific names that have been kept in synonymy for a century or so. Material from the Old World is also considered. A revised key is provided.

For the material on which this study is based, I am deeply grateful to the curators of the herbaria cited, for their help in providing types and other pertinent specimens. The initials of the herbaria, as cited, are those of Lanjouw and Stafleu (Index Herbariorum, ed. 3. 1956).

This series, named for the earliest described species of the group, *Aeschynomene viscidula* Michx., includes a few closely related species of the section *Ochopodium* Vog. The plants are disconcertingly similar in appearance, all prostrate to suberect herbaceous or suffrutescent perennials arising from woody roots. The leaves, flowers, and fruits are relatively small, the leaflets ranging from about 2 to 30 mm long, the flowers from 5 to 13 mm long, and the articles, or joints, of the loments from 2 to 5 mm in diameter. The stipules are attached at the

base, and the calyx is campanulate with five subequal lobes, or teeth.

In general, characters of the fruit are the most useful for separating the taxa. The number of articles can be counted, the length of the stipe and the dimensions of the articles can be measured. The kind and degree of pubescence is distinctive in a few species. Unfortunately, there is some instability, especially in certain species, that casts suspicion on the genetic composition and presents difficulties in key construction.

Since full descriptions are not included in this paper, except for new taxa, the following rather detailed key is presented.

#### KEY TO SPECIES AND VARIETIES

Fruit (1-) 2- or 3- (rarely 4- or 5-) articulate and short-stipitate, the stipe commonly 1-4 mm long, scarcely extending beyond the calyx, or, in a few cases, 5-7 mm long; bracteoles usually about half as long as the calyx or longer.

Leaves 5-9-foliolate, the leaflets obovate to cuneate; articles of fruit (3-) 4-5.5 mm in diameter.

Articles densely white-tomentulose and usually also beset with glandular hairs, sometimes the terminal article glabrate, 3.5-4 mm in diameter; stipe of fruit 1-3 mm long, mostly contained within the calyx (southern United States to northern and eastern South America)..... **1. *Ae. viscidula***

Articles glabrous to moderately appressed-pubescent, (3-) 4-5.5 mm in diameter; stipe of fruit 2-7 mm long, usually extending 1-4 mm beyond the calyx.

Fruit with articles 4-5.5 mm in diameter, glabrous, the stipe 4-7 mm long; bracteoles about as long as the calyx (Mexico..... **2. *Ae. acapulcensis***

Fruit with articles about 3-4 mm in diameter, appressed-pubescent to glabrate, the stipe 2-7 mm long; bracteoles about one-half as long as the calyx (South Africa; Madagascar; Mauritius; Réunion; eastern Australia)

#### **3. *Ae. brevifolia***

Leaves 10-32-foliolate, the leaflets obovate to linear-oblong, occasionally some leaves with fewer leaflets; articles of fruit 2-3 (-5) mm in diameter.

Stipe of fruit 3-7 mm long, commonly hispidulous with hairs about 1 mm long.

- Surface of articles crisp-pubescent to subglabrous and also best with glandular hairs; stipe 3-4 (-5) mm long; leaves mostly 10-20-foliolate, the leaflets obovate to oblong.
- Fruit 2- or 3-articulate, rarely 4-articulate, the stipe 3-4 mm long; leaves predominantly 10-14-foliolate, the leaflets obovate or obovate-elliptic.
- Flowers 5-8 mm. long; articles of fruit 2.5-3 mm long, 2-3 mm wide (widespread in tropical America)
- 4a. *Ae. brasiliiana* var. *brasiliiana***  
Flowers about 10 mm long; articles of fruit 4-5 mm long, 3-4 mm wide (Upper Orinoco, Venezuela)
- 4b. *Ae. brasiliiana* var. *carichanica***  
Fruit 4- or 5-articulate, the stipe 4-5 mm long; leaves 14-20-foliolate, the leaflets oblong or obovate-oblong (northern Venezuela)
- 4c. *Ae. brasiliiana* var. *venezolana***  
Surface of articles crisp-puberulent to glabrate; stipe 5-7 mm long; leaves about 20-32-foliolate, the leaflets elliptic (Minas Gerais, Brazil)..... **5. *Ae. vogelii***  
Stipe of fruit 1.5-3 mm long, hispid, the hairs 2-4 mm long, concentrated at base of the first article; surface of articles glabrous to moderately pubescent but lacking glandular hairs.
- Articles of fruit 2-2.5 mm in diameter; flowers 4-7 mm long; leaflets entire, oblong-elliptic, rarely somewhat obovate.
- Leaflets 4-6 (-8) mm long, 1.5-3 mm wide; stipules linear-lanceolate, about 1 mm wide at the base, 4-5 mm long; stems usually prostrate.
- Fruit with articles glabrous to moderately crisp-puberulent; stems and leaves moderately pubescent or often glabrate (widespread in Central and South America)
- 6a. *Ae. histrix* var. *histrix***  
Fruit with articles appressed-pubescent; stems and leaves canescent (Central and South America; one collection from Florida)
- 6b. *Ae. histrix* var. *incana***  
Leaflets 7-12 mm long, 2-4 mm wide; stipules broadly lanceolate, usually 2-3 mm wide at the base, 5-15 mm long; stems suberect (Mexico to South America)
- 6c. *Ae. histrix* var. *densiflora***  
Articles of fruit 2.5-3 mm in diameter; flowers 7-9 mm long; leaflets setiferous, ovate or linear-oblong, or sometimes entire and linear-oblong.
- Leaflets 2-5 mm long, 1-2 mm wide, ovate to elliptic-oblong, each bearing one or more yellowish, bulbous-based, glandular setae (Paraguay; Misiones, Argentina)
- 6d. *Ae. histrix* var. *multijuga***  
Leaflets 5-10 mm long, 1.5-2 mm wide, linear-oblong, entire of ciliate (Paraguay)
- 6e. *Ae. histrix* var. *apana***  
Fruit 4-9-(infrequently fewer) articulate and long-stipitate, the stipe (4-) 5-15 mm long; bracteoles about 1 mm long, or one-third as long as the calyx.
- Articles of fruit 2-2.5 mm in diameter; stipe commonly 10-15 mm long; leaves mostly 10-18-foliolate, the leaflets obovate or obovate elliptic (widespread in tropical America)..... **7a. *Ae. elegans* var. *elegans***  
Articles of fruit 3-5 mm long, 2.5-4 mm wide. Leaves predominantly 9-32-foliolate.
- Flowers 5-10 mm long; fruit with articles 3-4 mm long and 3 mm wide.
- Leaflets obovate or obovate-elliptic; leaves 5-14-foliolate; stipe of fruit (4-) 5-8 mm long.
- Fruit with articles 3-4 mm long and 3 mm wide; flowers 8-10 mm long; leaflets about 10-20 mm long, 5-10 mm wide (Goyaz, Brazil)
- 7b. *Ae. elegans* var. *robustior***  
Fruit with articles about 3 mm in diameter; flowers 5-7 mm long; leaflets 3-10 mm long, 2-4 mm wide (coastal Brazil; Puerto Rico)
- 8. *Ae. gracilis***  
Leaflets elliptic or oblong-elliptic, 5-15 mm long, 3-4 mm wide; leaves 16-20-foliolate; flowers 7-10 mm long; articles of fruit 3-4 mm long and 3 mm wide; stipe 7-10 mm long (southeastern Colombia; western Brazil)
- 9a. *Ae. foliolosa***  
Flowers 10-15 mm long; fruit with articles about 5 mm long and 4 mm wide; leaflets elliptic or obovate-elliptic, 7-20 mm long, 5-10 mm wide (Rio de Janeiro, Brazil)..... **10. *Ae. bradei***  
Leaves 5-8-foliolate.
- Leaflets obovate or obovate-elliptic, obtuse, entire, 3-15 mm long, 2-6 mm wide.
- Flowers 7-10 mm long; leaves not more than 8-foliolate; fruit usually 6-8-articulate, the stipe 6-14 mm long.
- Fruit with articles about 3-4 mm long, 2.5-3.5 mm wide; flowers 7-9 mm long (widespread in tropical South America)
- 11a. *Ae. falcata* var. *falcata***  
Fruit with articles 4-5 mm long and 3-4 mm wide; flowers 8-10 mm long (Paraguay)
- 11b. *Ae. falcata* var. *hassleri***  
Flowers 5-7 mm long; leaves 5-12-foliolate; fruit (3-) 4-7-articulate, the stipe (4-) 5-8 mm long (costal Brazil; Puerto Rico)..... **8. *Ae. gracilis***  
Leaflets elliptic-oblong, acute, 12-30 mm long, 5-10 mm wide, the margins closely ciliate; fruit 3- or 4-articulate, the stipe about 5-7 mm long, the articles about 3 mm in diameter (Minas Gerais, Brazil)
- 12. *Ae. warmingii***

1. *Aeschynomene viscidula* Michx. Fl. Bor. Am. **2**: 74. 1803, non Roxb. ex Willd. 1809.

*Aeschynomene prostrata* Poir. in Lam. Encyc. Suppl. **4**: 76. 1816.

*Secula viscidula* (Michx.) Small, Fl. Miami **90**, 200. 1913.

*Aeschynomene eriocarpa* Standl. & Steyerl. Field Mus. Publ. Bot. **23**: 9. 1943.

This species is easily recognized by its short-stipitate, densely tomentulose fruits. Even though geographically widespread, the morphological characters are generally uniform in all the material observed. The chief instability appears to be in the fruit indument; the glandular hairs may fail to develop, or sometimes the terminal one or two joints of the loment may be glabrous.

2. *Aeschynomene acapulcensis* Rose, Contr. U.S. Nat. Herb. **5**: 191. 1899.

*Aeschynomene picachensis* Brandeg. Univ. California Publ. Bot. **6**: 181. 1915.

On the basis of the fruit characters indicated in the key, this glabrous-fruited Mexican species has been retained as separate from the pubescent-fruited *Ae. brevifolia* which occurs in the Old World. It is my strong feeling, however, that the two taxa might ultimately be proved conspecific. The geographic separation could be explainable in terms of early sailing routes and the practice of transporting animals and fodder, but the evidence is scanty. Thus far I have seen only three collections from Mexico and but slightly more material from Africa, Madagascar, and the other known localities for *Ae. brevifolia*.

Vegetatively, the plants of *Ae. acapulcensis* and *Ae. brevifolia* are virtually indistinguishable. They may range from glabrous to pubescent, and there is considerable variation in stipe length of the fruit, even on individual specimens.

3. *Aeschynomene brevifolia* L. ex Poir. in Lam. Encyc. **4**: 451. 1797.

*Hedysarum micranthos* Poir. in Lam. Encyc. **6**: 446. 1806.

*Aeschynomene micrantha* (Poir.) DC. Prodr. **2**: 321. 1825.

*Patagonium racemosum* E. Mey. Comm. Pl. Afr. Austr. **1**: 123. 1835.

As already indicated in the key and in the comments under the preceding species, *Ae. brevifolia*, based on a collection from Madagascar, is scarcely distinguishable from *Ae. acapulcensis* from Mexico. Except for differences in fruit indument, some of the specimens with glabrate leaflets and fruits, from Madagascar and Réunion, for example, are quite similar to material

of the type collection of *Ae. acapulcensis*. Other specimens with more glandular development, such as most from South Africa, vegetatively resemble the type collection of *Ae. picachensis*, which I consider referable to *Ae. acapulcensis*.

I have seen a sheet from L that I presume to be an isotype of *Patagonium racemosum* E. Mey. collected by Drege in Africa. It is essentially identical with other collections of *Ae. brevifolia* from Africa.

The collections from Australia seem to belong to this species but approach *Ae. gracilis* in longer leaf axis, and *Ae. falcata* in fruit characters, having longer stipes and sometimes four or five articles instead of the customary two or three. The bracteoles are slightly shorter than average. Bentham (Fl. Austral. **2**: 227. 1864) considered this material as "quite identical" with *Ae. falcata* var. *paucijuga* from Brazil, and cited *Ae. micrantha* as a synonym.

There has been a question as to the correct name for this taxon. Apparently Poirét validated the Linnaean name *Ae. brevifolia*, based on a collection by Commerson in Madagascar, and then, later, published *Hedysarum micranthos* based on material of presumably the same collection. I have not yet learned the circumstances of Linnaeus's connection with the Commerson collection, nor has a sheet been located with "*brevifolia*" in Poirét's handwriting.

From P I have seen isotypes of *H. micranthos* and a photographic negative of the type. One sheet with Commerson's handwriting attests to the authenticity of the collector's name and locality. The type and one of the isotypes have been annotated by Poirét as *Hedysarum micranthos*. On two other sheets, including one from Desvau's herbarium, are the three names, *Hedysarum micranthos*, *Aeschynomene micrantha*, and *Aeschynomene brevifolia*. It would appear that Desvau's interpretation of the three names as synonymous would be correct and that the name *Ae. brevifolia* should have priority.

Unfortunately, the sheet in the Lamarek herbarium, labeled as the type of *Ae. brevifolia*, appears to be incorrect. A fragment of ample size for determination, lent me from P, is identical with type material of *Hedysarum falcatum*, based on a Commerson collection in Brazil. There must have been an error in labeling this particular sheet.

There are additional labels on this putative, but apparently erroneous, type sheet. Annota-

tions "du bresil," "de Commerson," and "Aeschynomene brevifolia. Dict. No. 10" are in Lamarek's hand. Desvaux added the names "hedysarum falcatum Poir. enc. en Desv." That Desvaux recognized a confused situation is indicated by other labels, "hedysarum micranthos Poir. enc. en Desv." and "Ces deux plantes etoient sous un seul nom dans cet herbier *Aesch. brevifolia* mais j'ai la certitude que la *brevifolia* est l'hedys. micranthos du meme auteur et que l'autre qui n'est pas de Madagascar mais du bresil est l'hedys. falcatum Poiret."

I am greatly indebted to Dr. Alicia Lourteig for doing considerable research for me in locating the pertinent specimens, transcribing certain labels, and photographing types that could not be lent.

4a. *Aeschynomene brasiliiana* (Poir.) DC. var. **brasiliiana.**

*Aeschynomene brasiliiana* (Poir.) DC. Prodr. **2**: 322. 1825.

*Cassia biflora* Mill. Gard. Dict. ed. 8, no. 14. 1768, non L. 1753.

*Hedysarum brasiliianum* Poir. in Lam. Encycl. **6**: 448. 1804.

*Cassia houstoniana* Collad. Hist. Nat. Med. Cass. 132. 1816.

*Aeschynomene paucijuga* DC. Prodr. **2**: 321. 1825.

*Aeschynomene paucijuga* var. *subscabra* DC. Prodr. **2**: 321. 1825.

*Hedysarum hirtum* Vell. Fl. Flum. 319. 1825; Icon. **7**: tab. 151. 1835.

*Aeschynomene brasiliiana*  $\beta$  Vog. Linnaea **12**: 90. 1838.

*Aeschynomene biflora* (Mill.) Fawc. & Rendle, Fl. Jam. **4**: 27. 1920.

*Aeschynomene guaricana* Pittier, Bol. Tecn. Minist. Agric. & Cría, Serv. Bot. Caracas **5**: 41. 1944, without Latin diagnosis.

This widely distributed species is readily identifiable by the fruit, flower, and leaf characters given in the key. The material is generally uniform, with minor variation in size of vegetative parts due, probably, to habitat factors. A few specimens show reduction in fruit indument. What appear to be more significant variations are indicated in the following two taxonomic varieties.

4b. *Aeschynomene brasiliiana* (Poir.) DC. var. **carichanica** Rudd, var. nov.

A varietate typica floribus fructibusque majoribus differt.

The plants are more robust and the flowers and fruits significantly larger than those of the typical variety, the flowers about 10 mm long,

the articles of the fruit 4–5 mm long and 3–4 mm wide.

Type in the U.S. National Herbarium, no. 2167562, collected on the north end of Cerro Carichana (Cerro Gavilan), elevation 100–300 m, December 21, 1955, by J. J. Wurdack and J. V. Monachino (no. 40885). Duplicates at NY and VEN.

4c. *Aeschynomene brasiliiana* (Poir.) DC. var. **venezolana** Rudd, Contr. U.S. Nat. Herb. **32**: 80. 1955.

This variety, known only from northern Venezuela, differs from the typical variety in leaf and fruit characters, the leaves consistently narrower and the fruits with longer stipes and more numerous articles.

5. *Aeschynomene vogelii* Rudd, nom. et stat. nov. *Aeschynomene podocarpa* var.  $\beta$  Vog. Linnaea **12**: 89. 1838.

*Aeschynomene falcata* var.  $\gamma$  *multijuga* Benth. in Mart. Fl. Bras. **15**(1): 68. 1859.

This taxon appears to warrant specific status, and designation of a new name is necessary. The epithet *vogelii* is chosen in honor of Dr. J. R. Theodor Vogel, the author of many of the taxa of this series, including the variety on which this species is based.

In my earlier paper I treated *Ae. podocarpa* and its var.  $\beta$  as synonymous. Since then I have had the privilege of examining additional specimens and have concluded that the fragment at F, labeled as *Aeschynomene podocarpa*, must be a portion of the Sellow collection on which var.  $\beta$  was based, rather than typical *Ae. podocarpa*. The identity of typical *Ae. podocarpa* is problematic, but I now believe that it is referable to *Ae. elegans*.

Bentham based his *Ae. falcata* var.  $\gamma$  *multijuga* on *Ae. podocarpa* var.  $\beta$  and cited two Brazilian collections. One, the type, is the Sellow collection from Serra Itambé, Minas Gerais, and is the basis of my *Ae. vogelii*. The other, collected by Weddell "in arenosis maritimis Rio de Janeiro," is represented by a sheet at P, annotated in what appears to be Bentham's hand, but it actually is *Ae. elegans* and is quite unlike the Sellow collection.

There are two additional collections from Minas Gerais that seem to belong to this taxon: *Riedel* 943, from Serra de Lapa (NY), and *Markgraf, Mello Barreto, & Brade* 3455, from Serra do Grão Mogol (RB; US, fragment). The

material is essentially like the specimens of the Sellow collection except that the leaflets average a little smaller in size and exhibit more glandular development, with the margins mostly glandular-denticulate.

- 6a. *Aeschynomene histrix* Poir. var. **histrix**.  
*Aeschynomene histrix* Poir. in Lam. Encyc. Suppl. 4: 77. 1816.  
 ? *Aeschynomene cassioides* Desv. in Ham. Prod. Pl. Ind. Occ. 51. 1825.  
 ? *Aeschynomene echinus* Vog. Linnaea 12: 92. 1838.  
*Aeschynomene conferta* Benth. Ann. Nat. Hist. 3: 433. 1839.  
*Aeschynomene mucronulata* Benth. Hook. Journ. Bot. 2: 56. 1840.  
*Aeschynomene histrix* var. *mucronulata* Benth. in Mart. Fl. Bras. 15(1): 69. 1859.  
*Secula hystrix* (Poir.) Small, Man. Southeast Fl. 728. 1933.  
*Aeschynomene pineticola* Standl. & Wms. Ceiba. 1: 79. 1950.

This species *sensu latior* is polymorphic and fairly widespread in Tropical America. The principal variations are indicated in the key.

In this paper I am following Benthham who assigned *Ae. echinus* to *Ae. histrix* "ex descr." Although I am tentatively placing *Ae. echinus* under the typical variety of *Ae. histrix*, it is possible that it is the same as *Ae. histrix* var. *densiflora*. The specimens that I previously determined as *Ae. echinus* are referred in this paper to two other varieties of *Ae. histrix*, var. *apana*, and var. *multijuga*.

Presumably Vogel in his examination of the Sellow specimens from Brazil made few comparisons with specimens from beyond that country's borders. He must have disregarded *Ae. histrix* from French Guiana (*Ae. densiflora* from British Guiana was not yet published) and initiated the new species *Ae. echinus*. In his description of *Ae. echinus* he states that the stipules, racemes, and flowers are as in the preceding species, which is his *Ae. incana*, another variety of *Ae. histrix*, according to the present treatment.

- 6b. *Aeschynomene histrix* Poir. var. **incana** (Vog.) Benth. in Mart. Fl. Bras. 15(1): 69. 1859 (As *Ae. hystrix* var. *incana*).  
*Aeschynomene puberula* DC. Prodr. 2: 321. 1825.  
*Aeschynomene incana* Vog. Linnaea 12: 90. 1838, non G. F. W. Mey. ex DC. 1825, as synonym.

As indicated in the key, var. *incana* is very

similar to the typical variety, differing chiefly in indument.

- 6c. *Aeschynomene histrix* Poir. var. **densiflora** (Benth.) Rudd, Contr. U.S. Nat. Herb. 32: 84. 1955.  
*Aeschynomene densiflora* Benth. in Hook. Journ. Bot. 2: 56. 1840.

Although there is intergradation between varieties of *Ae. histrix*, the specimens of var. *densiflora* usually are readily distinguished, especially from those of the typical variety, by their robust habit, and larger leaflets and stipules.

- 6d. *Aeschynomene histrix* Poir. var. **multijuga** (Chod. & Hass.) Rudd, comb. et stat. nov.  
*Aeschynomene brasiliiana* (Poir.) DC. forma *multijuga* Chod. & Hass. Bull. Herb. Boiss. II. 4: 882. 1904.

This taxon, originally published as a form of *Ae. brasiliiana*, has the principal characteristics, especially the dolabriform fruit structure, of *Ae. histrix*. It differs from typical *Ae. histrix* in having slightly larger flowers and fruits, and leaflets that are mostly denticulate with bulbous-based glandular setae.

Specimens of the type collection of this variety indicate a rather luxuriant, suffrutescent herb, 0.5–1.5 m tall. It was collected by Hassler (No. 5814) "in campo pr. flumen Carimbatay," Paraguay. I have seen isotypes from GH, MO, and NY.

The three other collections that I am assigning to this variety are from Misiones, Argentina, as follows: "On the Parana 26°–27° S. Lat.," *Parodi* 100 (K); Loreto, *Ekman* 1720 (NY); San Ignacio, *Burkart* 15344 (US). They apparently are from lower, more compact plants, with shorter internodes and slightly smaller leaflets. In the character of the fruits, flowers, and glandular setae, however, they appear to be essentially the same as specimens of the type collection.

In my earlier paper I interpreted this material as representing *Ae. echinus*. While the exact identity of *Ae. echinus* is still in doubt, I now think that it is more likely to be the same as typical *Ae. histrix*, or possibly *Ae. histrix* var. *densiflora*. The type locality of *Ae. echinus* also is not exactly known but on the basis of what is known of Sellow's itinerary, presumably it is from farther south or east than the above cited specimens. So far I have seen nothing like var. *multijuga* from the range of Sellow's travels.

6c. *Aeschynomene histrix* Poir. var. *apana* Rudd, var. nov.

A varietate typica foliolis elongatis, floribus fructibusque majoribus differt.

The specimens of this variety, because of the linear-oblong leaflets, 5–10 mm 1.5–2 mm wide, have an aspect quite different from others of *Ae. histrix*, yet the flowers and fruits are all essentially the same. Occasional leaflets of var. *apana* have a few marginal glandular setae such as are found in var. *multijuga*.

Type in the U. S. National Herbarium, no. 1177243, collected near the Río Apa, at Centurión, Paraguay, December 9, 1908, by K. Fiebrig (no. 4387). Duplicate at GH. Additional material is the Hassler collection no. 11021 (F, GH, NY, US), also from near the Río Apa, Paraguay.

7a. *Aeschynomene elegans* Schl. & Cham. var. *elegans*.

*Aeschynomene elegans* Schl. & Cham. Linnaea **5**: 583. 1830.

*Aeschynomene tecta* Vog. Linnaea **12**: 87. 1838.

*Aeschynomene falcata* Vog. var. *plurijuga* Benth. in Mart. Fl. Bras. **15**(1): 68. 1859.

*Aeschynomene falcata* Vog. var. *elegans* (Schl. & Cham.) O. Ktze. Rev. Gen. **1**: 158. 1891.

*Aeschynomene falcata* Vog. var. *elegans* (Schl. & Cham.) O. Ktze. forma *glabrior* O. Ktze. Rev. Gen. **1**: 158. 1891.

*Aeschynomene arenicola* Brandeg. Univ. California Publ. Bot. **10**: 408. 1924.

This species is easily recognized by its slender, long-stipitate, small-jointed, moniliform fruits. It is one of the most widespread of the series, ranging from Mexico to southern Brazil.

Many of the collections annotated and cited by Bentham as *Ae. falcata* actually are specimens of *Ae. elegans*. His *Ae. falcata* var. *plurijuga*, based on *Ae. tecta* and *Ae. podocarpa*, certainly must be the same as *Ae. elegans*. Sellow specimens from Brazil annotated as *Ae. tecta*, presumably isotypes, are *Ae. elegans*.

The identity of typical *Ae. podocarpa* still is in question. I have seen no Sellow specimens annotated as such or any that I can relate to the original description.

Previously, on the basis of characters in the original description and examination of a small photographic negative of type material, I decided that *Ae. gracilis* should be placed in synonymy under *Ae. elegans*. I have now seen isotypes of *Ae. gracilis* and conclude that it should be reinstated as a distinct species.

7b. *Aeschynomene elegans* Schl. & Cham. var. *robustior* Rudd, var. nov.

A varietate typica foliolis fructibusque majoribus differt.

As characterized in the key, this more robust variety of *Ae. elegans* is recognized by its relatively larger leaves with 10–14 leaflets, 10–20 mm long and 5–10 mm wide, and fruit with larger articles, 3–4 mm long and 3 mm wide. The fruit stipe is about 5–8 mm long, in contrast to the 10–15 mm long stipe that is customary in typical *Ae. elegans*.

Type in the Herbarium of the Royal Botanic Gardens, Kew, collected at Brejon, near Santa Cruz, Goyaz, Brazil, by J. E. Pohl, in 1820.

There are two other sheets at K that appear to belong to the same collection, labeled no. 1101, but without collector's name.

8. *Aeschynomene gracilis* Vog. Linnaea **12**: 89. 1838, non Miq. 1844.

*Aeschynomene portoricensis* Urb. Symb. Antill. **1**: 325. 1899.

After examining isotypes of *Ae. gracilis* from Brazil and *Ae. portoricensis* from Puerto Rico, it seems appropriate to combine the two species. Their close similarity was mentioned by Urban in connection with his publication of *Ae. portoricensis*. The former species is known only from the type collection by Sellow in Brazil between Campos, Rio de Janeiro, and Victoria, in Espírito Santo. The latter species, which has been frequently collected in Puerto Rico, is somewhat variable as to leaf size, number of articles per fruit, and stipe length, but several specimens are essentially identical with the Sellow collection from Brazil.

There is some similarity to *Ae. falcata* in fruit characters but the stipe of *Ae. gracilis* is usually shorter and the lomenta have fewer, obliquely semioval joints. The flowers are smaller. The leaves seem to be intermediate between *Ae. elegans* and *Ae. micrantha*.

9. *Aeschynomene foliolosa* Rudd, Contr. U.S. Nat. Herb. **32**: 91. 1955.

This is a distinctive species with panicles of small flowers and slender long-stipitate fruits. The leaves are relatively long with 16–20 oblong-elliptic leaflets.

In the original description only two localities are cited, both from the outer periphery of the Amazon Basin. Recently another collection from a somewhat intermediate area has been recog-

nized, *Ducke* [Herb. No.] 12382 (MG), collected December 14, 1912, at Campo da Frequezia Velha, Coary, Brazil.

10. *Aeschynomene bradei* Rudd, sp. nov. Fig. 1

Suffrutex diffusus, ad sectionem *Ochopodium* pertinet, foliis 3–5 cm longis, 9–16-foliolatis, foliolis ellipticis, adpresse pubescentibus; *Ae. elegans* var. *robustior* affinis sed imprimis floribus fructibusque majoribus differt.

Stems suffrutescens, rusty-tomentose when young, somewhat glandular-hispidulous, glabrescent; stipules lanceolate or lanceolate-ovate, about 5–8 mm long, attenuate, 1–2 mm broad at the base, pubescent like the stem; leaves about 3–5 cm long, 9–16-foliolate; leaflets elliptic or obovate-elliptic, 7–20 mm long, 5–10 mm broad, obtuse, mucronulate, entire, moderately appressed-pubescent on both surfaces, the hairs colorless or sometimes rusty; inflorescences axillary, racemose, slightly longer than the subtending leaves; bracts deltoid-ovate, about 1 mm in diameter, pubescent, the bracteoles ovate, about 2 mm long and 1 mm wide; flowers yellow, 10–15 mm long; calyx 3–5 mm long campanulate with 5 subequal lobes about 2 mm long, ciliate, subglabrous to glandular-hispidulous; standard 10–15 mm long, the claw 2–3 mm long, the blade suborbicular, 8–10 mm in diameter, pubescent on the outer face; wings and keel slightly shorter than the standard, the wing blades oblique, 4–5 mm broad, the keel blades about 2 mm broad, bent at about a 90° angle; stamens 8–12 mm long, monadelphous, the filaments united from base to midlength, the sheath open on the carinal side; ovary 5-ovulate, pubescent; fruit 2–5-articulate, the stipe subglabrous, 7–10 mm long, the articles crisp-pubescent, about 5 mm long and 4 mm wide; seed brownish black, sublustrous, 3 mm long, 2 mm broad, and compressed to 1 mm or less in thickness.

Type in the herbarium of the Jardim Botânico do Rio de Janeiro, no. 28707, collected at Pedra Dubois, Santa Maria Madalena, Rio de Janeiro, Brazil, altitude 1,100 m. February 27, 1935, by Santos Lima and A. C. Brade (no. 14220). Fragment and photograph at US.

Only one other specimen is known, a unicate at RB, collected at Pedra das Flores, Santa Maria Madalena, Rio de Janeiro, Brazil, altitude 1,200 m, March 4, 1934, by Santos Lima and A. C. Brade (no. 13273). Fragment at US



FIG. 1.—*Aeschynomene bradei*: a, Portion of stem with leaf, immature flower, and fruit (nat. size); b, standard; c, wing; d, keel; e, calyx and stamen filaments; f, one article of fruit, open, showing seed. (b–f,  $\times 2$ .)

This species, represented by the two collections cited above, is readily referable to series *Viscidulae* of section *Ochopodium*. In general structure it resembles such related species as *Aeschynomene falcata*, *Ae. elegans*, *Ae. vogelii*, and *Ae. foliolosa*. In aspect it is rather distinctive due to more robust, woody growth, larger flowers and fruits. The critical characters are indicated in the key.

11a. *Aeschynomene falcata* (Poir.) DC. var. *falcata*.

*Aeschynomene falcata* (Poir.) DC. Prodr. 2: 322. 1825.

*Hedysarum falcatum* Poir. in Lam. Encyc. Meth. Bot. 6: 448. 1804.

*Hedysarum diffusum* Vell. Fl. Flum. Text 320. 1825; Icon. 7: pl. 155. 1835.

*Aeschynomene falcata* (Poir.) DC. var. *paucijuga* Benth. in Mart. Fl. Bras. 15(1): 67. 1859.

*Aeschynomene apoloana* Rusby, Bull. New York Bot. Gard. 6: 511. 1910.

An isotype and a photographic negative of the type of *Hedysarum falcatum* Poir., on which *Ae. falcata* is based, have recently been sent to me from Paris. This authentic material, in the Jussieu Herbarium, was collected by Commerson in Brazil. It has characteristic falcate fruit and 5–8-foliolate leaves, and confirms our concept of the species.

As explained under *Ae. brevifolia*, material from a sheet in the Lamarek Herbarium and labeled as the type of *Aeschynomene brevifolia* L. ex Poirlet, appears to be identical with the type material of *H. falcatum*. According to the description, *Ae. brevifolia* was collected by Commerson in Madagascar. There must have been

an error in labeling the collection, however, as this specimen does not fit the description of *Ae. brevifolia*, and must really be a duplicate of Commerson's Brazilian collection of *Hedysarum falcatum*.

11b. *Aeschynomene falcata* (Poir.) DC. var. *hassleri* Rudd, var. nov.

A varietate typica foliis fructibus floribusque majoribus differt.

In comparison with material of typical *Ae. falcata*, the specimens of this variety are outstanding in appearance due to more vigorous growth, especially their larger flowers, fruits, and leaves. The differences apparently are in degree rather than structural pattern.

This is another example of specimens from

Paraguay being significantly more robust and with larger organs than their closest relatives.

Type in the Herbarium of the Royal Botanic Gardens, Kew, collected in a thicket near Concepción, Paraguay, September 1901, by E. Hassler (no. 7461). Isotype at NY.

There is an additional sheet at K, also collected by Hassler (no. 10977), "In altaplanitie, Sierra de Amambay," Paraguay, 1913.

12. *Aeschynomene warmingii* Micheli, Vid. Medd. Nat. Foren. Kjøbenhavn 68. 1875.

As indicated in the key, this species from Lagoa Santa, Minas Gerais, Brazil, is distinctive with its fairly large, 5-7-foliolate leaves. Unfortunately, it is known only from the type collection.

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## INSECTS AS FLYERS

Insects are the most efficient flying animals. They surpass both birds and bats. They are superior in some ways to any "flying machine" yet invented by man. The air was their exclusive domain for at least 100 million years before any rival winged creatures appeared. During this time they developed two flight systems, direct and indirect, which are in use today, although the former is confined to a few groups such as the dragonflies.

This is the claim of Dr. R. E. Snodgrass, research associate of the Smithsonian Institution, in a report on arthropod evolution recently published by the Institution. The earliest known insects, with highly developed jumping mechanisms, were wingless. There are some wingless forms today. But, Dr. Snodgrass points out, the earliest known winged insects in the fossil record had the flying mechanism fully developed so that its evolutionary development largely is a matter of conjecture.

The first step, as deduced by Dr. Snodgrass, was the emergence from the sea of some long extinct many-footed wormlike creature. The feet were fleshy lobes by means of which it had moved clumsily along the sea bottom. A first evolutionary step was the elimination of these lobes on all but the first three segments of the body behind the head. These gradually evolved into legs.

The earliest insects, Dr. Snodgrass says, to come on land presumably were provided with so-called "paranotal lobes," small appendages attached to the back in the region of the thorax. These are not hypothetical structures which since have disappeared, he says, since there are traces of them in various modern insects and in others; during the nymph stage, wings first appear as lobelike extensions from the back.

"Presumably," says Dr. Snodgrass, "when these paranotal lobes became sufficiently large in the primitive insects they first served as gliders. If the at first rigid lobes became flexible at their bases they could then, by action of the thoracic muscles, be flapped up and down, thus enabling the gliding insect to sustain itself longer in the air. Even this simple wing movement, however, involved modifications of the thoracic skeleton and some degree of adaptation in the musculature."

Eventually, he points out, the back muscles became differentiated to the point where they could move the wings without the help of any wing muscles per se. This is the "indirect" system of most insects.

Development of wings was evidently a response to demand. The first winged insects appear very shortly after the appearance of the first tall plants in the primeval swamps.